The European VMS

An illustration of the successful introduction of advanced technologies for MCS

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1. SUMMARY

This paper provides an overview of recent developments in the European Union with respect to satellite based vessel monitoring systems (VMS) for fishing vessels. In particular, it contains some background information on the approach to fisheries control and enforcement in the European Union, as well as a brief description of the current status of VMS.

The paper gives an outline of both internal programmes (i.e. within the European Union) and external programmes (i.e. in bilateral fisheries agreements between the European Union and certain third countries and in the framework of certain regional fisheries organisations) in relation to satellite monitoring.

The paper also indicates areas for further development of VMS as a tool for monitoring, control and surveillance in the international context.

2. BACKGROUND

Fishing is important to the European Union on two accounts. Firstly, the Community is one of the largest fish producers in the world. Secondly, as a consumer, the Community represents the largest global market for fishery products. The commitment of the Community to the sector has been expressed in the Common Fisheries Policy (CFP) which was formally adopted by the Council in 1983.

In response to internal and external events, the CFP has evolved from a basic policy into a comprehensive and dynamic fisheries regime. It now regulates all aspects of the fishing industry. The policy is comprised of three inter-linked elements made up of conservation, markets and structural measures. Control and inspection are key components of the CFP which have the ultimate aim of improving compliance with regulations at all stages of the industry from harvesting through to processing and marketing.

Notwithstanding that the rules governing the CFP are adopted at Community level, the main responsibility for ensuring that the rules are applied and enforced rests with the competent inspection and control authorities of each individual Member State. Each

Member State must police its own waters and control the activities on its territory.

The organisation of the Monitoring, Control and Surveillance (MCS) services differs from one Member State to another. Some have inspection services dedicated specifically to fisheries activities whilst others call on several different government departments which also perform functions other than fisheries surveillance.

Fisheries control entails big costs for the Member States. The total expenditure incurred by Member States is estimated to EURO 300 million per annum. The Community is helping the Member States by providing a financial contribution to strengthen their control measures, notably for the introduction of modern technologies.

The European Union has advocated the use of modern technologies for MCS tasks. This approach is evident from the support the European Union has given to the research and development of satellite monitoring as a means to improve the enforcement of the common fisheries policy.

3. THE EARLY YEARS OF SATELLITE MONITORING

3.1 EU Pilot projects for satellite monitoring (1994-1995)

In 1992, the European Commission proposed the introduction of a continuous position-monitoring system using satellite communications for fishing vessels, in order to improve the effectiveness of surveillance of fishing activities.[1]

Subsequently, the Fisheries Council of the European Union decided that Member States were to carry out pilot projects, in co-operation with the Commission, in order to assess the technology to be used and the vessels to be included in the above mentioned system as provided for by Article 3 of the "Control Regulation" [2] . Commission Regulation (EC) No 897/94 laid down detailed rules for the pilot projects.

Thirteen EU Member States (Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, the Netherlands, Portugal, Finland, Sweden and the United Kingdom) have carried out pilot projects for satellite monitoring, involving up to 350 vessels throughout the Community.

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1 COM(92) 392 final.

2 Council Regulation (EEC) No 2847/93 establishing a control system applicable to the common fisheries policy.

Three different, commercially available, satellite-based VMS were used to track the movements of the participating vessels. Several Member States tested more than one of these systems. All Member States evaluated the potential of GPS/INMARSAT-C. Some Member States also tested ARGOS and/or EUTELTRACS. In a complementary project, Greece researched and tested a monitoring system which depended on VHF/DSC data communication as opposed to relying upon a satellite communication system. The United Kingdom also conducted trials with Automatic Position Recorders (APR), which store data onboard the vessel without transmitting information in real-time.

The way in which the pilot projects were set up is an illustration of the close co-operation between EU Member States to overcome technical and practical difficulties. Each Member State operated through a Fisheries Monitoring Centre (FMC), which was able to determine the position of its fishing vessels included in the pilot project, wherever they operated. The data from each vessel were always directed to the FMC of its Flag State. If the vessel's position was in the waters under the jurisdiction of another Member State, the Flag State FMC re-transmitted the position data to the Coastal State concerned. By this procedure each Member State received position information relating to all vessels included in the pilot project and operating in waters under its jurisdiction or sovereignty.

The pilot projects were funded from the Community budget. The total expenditure amounted to EURO 7,9 million. The projects started in July 1994 and ended in December 1995. The pilot projects were co-ordinated by the European Commission.

After the pilot project a number of Member States continued to use the systems as a means of improving and developing their understanding of this type of technology for fisheries enforcement and conservation purposes.

3.2 Evaluation of the pilot projects

The pilot projects proved the reliability of real-time satellite position monitoring and established that this type of technology will greatly enhance the efficiency and effectiveness of the existing aerial, surface and land based control resources.

Although the pilot projects in the Member States revealed a number of technical problems it also clearly demonstrated that these could be resolved by a joint approach between the project managers and the system providers.

3.3 Lessons learnt

VMS provides information. This information may be limited to obtaining the position of a fishing vessel at a particular time and date. VMS provides the user, however, with this information at frequent time intervals. These intervals may vary. In some instances it may be appropriate to have position reports every ten minutes, whereas in other instances it may be sufficient to have daily position reports. Information derived from the VMS may also include the course and speed of a vessel.

With VMS data it is possible to deduce the activity of vessels. For example, a series of consecutive positions at a speed in the range of 4-6 knots from a trawler may indicate that the vessel is towing gear. Precise position patterns of the activity of vessels will of course depend on the type of fishing vessel and the fishing activity pursued. Thus for example, the position, course and speed patterns of a long-line vessel will differ significantly from vessels engaged in other types of fishing.

VMS, if certain systems are relied upon, may also allow for the transmission of catch and effort data, and the benefits to be derived from this information are obvious for any management system which relies upon accurate catch and effort data to manage fisheries on a sustainable basis. This type of application is also of particular benefit in relation to monitoring fishing effort zones or in the case of sensitive or restricted fishing areas.

4. TOWARDS AN OPERATIONAL VMS

4.1. The genesis of a political agreement on the introduction of VMS

In May 1996, the European Commission presented a report on the pilot projects and a proposal for the introduction of an operational VMS to the Council of the European Union[1].

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[1] COM(96) 232 final, 96/0140(cns).

The European Parliament supported the Commission proposal to introduce a VMS for Community fishing vessels[1]. The Parliament is also in favour of financial contribution from the European Union in the setting up of this system. The Parliamentary report on VMS stresses the importance of the system being applied fairly in all Member States and the importance of not imposing excessive administrative burden on fishermen.

In December 1996 after considerable debate the Council reached a political agreement to introduce an operational system to monitor the activities of fishing vessels by satellite. The political agreement on VMS was formally enacted as Council Regulation (EC) N° 686/97 amending Regulation (EEC) N° 2847/93 establishing a control system applicable to the common fisheries policy.

4.2 Basic provisions

The VMS has been introduced in two phases.

In the first phase, which started on the 30 June 1998, vessels exceeding 20 meters between perpendiculars or 24 metres overall length in the following categories were required to be equipped:

- vessels operating in the high seas, except in the Mediterranean Sea,
- vessels catching fish for reduction to meal and oil.

In the second phase, which commenced on the 1 January 2000, all vessels exceeding 20 meters between perpendiculars or 24 metres overall length wherever they operate are subject to VMS.

There is, however, an exception for vessels operating exclusively within 12 nautical miles of the baselines of the flag Member State, and for vessels which operate at sea for less than 24 hours.

The satellite tracking devices fitted on board the fishing vessels shall enable the vessel to communicate its geographical position to the flag state and to the coastal Member State simultaneously. In practice position reports are retransmitted in nearly real time from the flag state to the coastal state, in the way they were already routed during the pilot projects. The data obtained from VMS shall be treated in a confidential manner.

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[1] Minutes of Sitting of Friday 13 December 1996 – PE 254.451.

In the meantime, the scope of VMS has been enhanced. Indeed, since 1 January 2000, *third-country* fishing vessels operating in the Community fishing zone shall also be equipped with a VMS position monitoring system[1].

Tampering with VMS has been defined as a serious infringement[2].

An obligation is placed on Member States to establish and operate Fisheries Monitoring Centres which will be equipped with the appropriate staff and resources to enable Member States to monitor the vessels flying their flag as well as the vessels concerned flying the flag of other Member States and third countries operating in the waters under the sovereignty or jurisdiction of the said Member State.

Member States shall take the necessary measures to ensure that the position reports received from fishing vessels to which a VMS applies are recorded in computer-readable form for a period of three years. The European Commission shall have access to these computer files on the basis of a specific request.

Each FMC receives a substantial amount of position reports. Although not an explicit requirement, it is commonly considered a good practice to analyse incoming reports automatically in order to detect "events" which may be of interest for MCS activities. Such "events" include :

- a vessel failing to report on schedule,
- a vessel reporting a position which is inconsistent or not credible compared to previously received reports,
- a vessel entering or leaving a specific area,
- a vessel travelling at, above or below a given speed,
- a vessel landing abroad.

Sophisticated VMS software may be capable of detecting complex events which might be a combination of those referred to above. For example, a vessel of a particular type, travelling below a given speed in a defined geographical area. Furthermore with VMS the time of arrival in port, the time of arrival on a specific fishing ground, ... can be predicted.

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1 Council Regulation (EC) N° 2846/98 amending Regulation (EEC) N° 2847/93 establishing a control system applicable to the common fisheries policy.

2 Council Regulation (EC) No 1447/1999 of 24 June 1999 establishing a list of types of behaviour which seriously infringe the rules of the common fisheries policy.

Satellite based vessel monitoring technology has evolved considerably since the period of the pilot projects. This trend is set to continue. The further development of ready-to-use products as well as the improvement in satellite services will greatly assist the realisation of the full potential of operational systems.

4.3 Detailed rules

Detailed rules for the implementation of the system were adopted by the European Commission taking into account the opinion of the Management Committee for Fisheries and Aquaculture. They are contained in Commission Regulation (EC) N° 1489/97 laying down detailed rules for the application of Council Regulation (EEC) N° 2847/93 as regards satellite-based vessel monitoring systems.

The main provisions concern:

- the requirements for the satellite tracking devices,
- the frequency of position reporting,
- the format for transmission to the coastal Member State,
- the procedures in case of technical failure,
- access to computer files by the European Commission, and
- a number of administrative arrangements between Member States and the Commission.

Several satellite systems exist that can meet the requirements of the EU Regulations. Neither the Council nor the Commission have imposed a particular system. Therefore any solution that meets the requirements is acceptable, and different vessels may be equipped with different systems.

4.4 Current status

The European Commission monitors the application of the relevant provisions of the Community legislation by Member States.

The European Commission regularly organises meetings of the Expert Group Fisheries Control with the national officials in charge in the Member States in order to facilitate the harmonised and simultaneous implementation of VMS in the European Union.

By June 2000, over 2.700 Community fishing vessels were actively tracked. Some Member States have delays with the implementation of their VMS, mainly due to the complex nature of the procurement procedures, but they are confident that they will still catch up in the coming months.

VMS has not replaced conventional enforcement tools such as patrol vessels and aircraft, it nevertheless improves the efficiency and effectiveness of their deployment.

The evidential value and admissibility of the evidence derived from VMS depends on the rules of evidence in the Member State in question.

4.5 The perceived cost/benefit of VMS

The cost of the VMS is dependent on the number of participating vessels and on the characteristics of the systems selected by the Member States. E.g. the annual cost of monitoring a fleet of 4,000 vessels is likely to be of the order of EURO 8 Million. Information on actual expenditure will, once available, allow a more detailed analysis.

The benefits from VMS will be derived from its utility and effectiveness as an enforcement tool to address the shortcomings in the enforcement of the CFP.

Firstly, VMS is the only control means that provides continuous information on the location of fishing vessels. This allows Member States to monitor directly the compliance with all provisions related to geographical restrictions, in particular closed areas and tie-up rules. In this respect all other control methods are more costly and less efficient for this purpose.

Benefits from satellite technology will further be achieved through the *synergy* with the conventional control means, in particular the improvement of the aerial and marine surveillance. Information provided by the VMS will improve the deployment of aircraft and patrol vessels. Less time will be spent with searching for the fishing vessels, more

time will be devoted to inspection. VMS may enable both aircraft flying hours and vessel sailing time to be reduced, hereby reducing the operational costs. An increase of 20% in the effectiveness of marine surveillance, which has an estimated annual cost of EURO 100 Million, is not unrealistic and already justifies the introduction of a VMS.

Furthermore, the shore-based inspectorate will benefit from the information provided by VMS. Its efficiency will be increased, since VMS will alert the inspectorate to possible illegal or unauthorised landings and transhipments, which traditionally have been very difficult to combat using conventional enforcement tools. VMS also offers valuable information with which the data in logbooks may be verified including the cross-checking of the catch area against positions recorded in the logbook. Further scope for improving control measures is provided by the facility introduced by VMS to collect more comprehensive statistics on fishing activity. Improved management information in turn enables the fishing activities to be better monitored.

Satellite monitoring also has a deterrent effect. Fishermen will be less inclined to mis-report their position and their activity, as they will be aware that the authorities are continuously monitoring their position. This form of preventive enforcement is very beneficial, it is however difficult to quantify. Its advantage over the deterrent effect of the traditional control means lies in its continuity and in its global geographical coverage.

The use of VMS and the exploitation of its communications features in real time would offer scope for much better co-ordination and greater *transparency* between the appropriate authorities. This would ensure equal treatment for all fishing vessels. This advantage is an essential one, but again cannot be quantified.

4.6 The advantages of VMS for the fishing industry

The advantages of VMS for the fishing industry may be categorised as follows:

- the direct benefit of having a more effective common fisheries policy;
- the facility to ease regulatory and administrative requirements;
- the provision of secure communications which may allow for the transmission and receipt of catch and market information;
- the provision of an accurate navigation system;
- the provision of improved safety features.

Each of these advantages is examined in turn.

A more effective Common Fisheries Policy

Improved enforcement of the common fisheries policy is in the interest of all fishermen. The industry accepts that improved regulatory compliance will come with a more efficient and effective enforcement policy. Fishermen will be the ultimate beneficiaries when the fisheries conservation and management policy is properly implemented and enforced in all Member States. It is in this way that stocks will recover and the future for the industry can be guaranteed.

Many fishermen are tired of trying to compete against colleagues who break the rules. The industry can be confident VMS benefits the law abiding fishermen by helping the enforcement and inspection authorities identify the vessels which are suspected of cheating. In particular, satellite data are used for:

- the detection of vessels heading for ports to make illegal landings;
- the monitoring of closed and sensitive zones to protect spawning stocks;
- the monitoring of vessels in areas where they have no licence or quota;
- ensuring that catch areas are accurately recorded in logbooks;
- monitoring the activities of third country vessels in the Community zone.

With VMS the law-abiding skipper can be satisfied that there will be less likelihood of the enforcement authorities inspecting vessels which comply with the law and a greater probability that inspection will focus on vessels which are suspected of transgressing the rules. Moreover, the industry can be assured that satellite surveillance will improve the uniform implementation and enforcement of Community rules in all Member States thus reducing the opportunities for offenders to make short term economic gains by risking the future for all fishermen.

Facilitation of regulatory requirements

VMS facilitates compliance with several regulatory requirements. Examples include the communication of:

- "entry" and "exit" reports from particular areas;
- the advance notification prior to arrival in port;
- "effort reports";
- activity reports to third country authorities for vessels operating under the terms of international fishing agreements.

Communication system

The satellite tracking device fitted on board the fishing vessels, depending on the particular system, allows fishermen to communicate anywhere at any time. The confidentiality of this facility is greater than that provided by terrestrial radio systems and cellular telephones.

Satellite communication and monitoring devices may also allow for additional features for improving communications such as:

- the receipt of market prices of fish in different ports which will help fishermen to obtain the best price for their catches;
- the exchange of weather information;
- the receipt of information on changes to quotas and in fishing regulations;
- communication with family, colleagues, agents or processors.

Indeed, with some satellite communication systems, anyone with a fax machine, a personal computer and modem, or a telex machine can communicate with vessels at sea. Vessels are no longer isolated.

Navigation System

The satellite tracking devices fitted on board the fishing vessels, depending on the particular system installed, provide fishermen with an accurate navigation system

which may have a position accuracy of up to 10 meters. Fishing vessels are able to plot their position, course and speed at all times. This allows skippers to keep an historical electronic record of the best fishing grounds or to plot wrecks or foul ground. Moreover, it allows vessels to plot and locate the positions of static gear in adverse sea and weather conditions.

Distress and Safety Communications

Fishing is a dangerous occupation. The satellite tracking devices fitted on board the fishing vessels, depending on which particular system is installed, give vessels access to distress and safety communications.

Because satellite technology continues to mature the aforementioned list of possible advantages is not exhaustive and in any case will largely depend on which system is selected. Furthermore, satellite communication costs continue to fall, as do hardware and software costs.

The value of VMS will only become fully apparent when it is completely operational. Indeed, the Commission may be able to propose a simplification of the regulatory burden as soon as the system is fully operational in all Member States.

5. EXTERNAL PROGRAMMES ON SATELLITE MONITORING

5.1 VMS as a means to assume flag state responsibility

The control system of the European Union was in the first place set up to protect fisheries resources evolving within Community waters. Consequently most of the control means are deployed within the Community.

Besides monitoring fisheries in Community waters, the European Union is nevertheless also responsible for a significant number of its vessels operating in different parts of the oceans.

Outside Community waters, fishing must take place with due regard to the management measures adopted by the competent international and regional bodies, and by the coastal states. Furthermore, where applicable, masters of community fishing vessels must comply with the national laws and regulations governing the waters of the coastal state, as well as with the specific provisions contained in the Fisheries Agreements.

The European Union is anxious to ensure that its vessels respect the various rules applicable in waters of third countries and on the high seas. Therefore, there are provisions, both within the various fisheries agreements with third countries and within regional conventions - such as NAFO and NEAFC -, allowing inspections by control services of third parties as well as the presence of their observers on board EU vessels during their activities in such areas. Where appropriate, these control activities are followed up by dockside inspections when the vessels return to their home port at the end of their fishing trip.

Under certain fisheries agreements, the European Union also provides financial aid to encourage coastal states to develop and to strengthen their monitoring, control and surveillance means.

Since the satellite tracking devices installed on board EU fishing vessels must be operational at all times, wherever the vessels operate, the control of the fleet operating outside Community waters is being increased significantly by the introduction of VMS. Indeed, the flag Member State knows at all times where its vessels are operating. Therefore the European Union is endeavouring to use VMS in bilateral fisheries agreements with third countries and in the framework of regional fisheries organisations. A limited number of cases are briefly described in the next section.

5.2 Selected cases

(i). NAFO Pilot Project for Satellite Tracking (1996-1998)

The EU has been involved in the pilot project for satellite tracking of the Northwest Atlantic Fisheries Organisation[1]. VMS will in principle apply in the NAFO Regulatory Area as from the year 2001.

(ii). NEAFC

The North East Atlantic Fisheries Commission, more commonly referred to as NEAFC, was established in 1953. At present, there are 6 Contracting Parties, among which the European Union.

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[1] Report by the European Union on the Evaluation of the Satellite Tracking Project, NAFO STACTIC Working Paper 97/33.

NEAFC took the responsibility to regulate a number of species, such as Oceanic Redfish, Blue Whiting, Atlanto Scandic Herring and Mackerel. These regulatory measures are complementary to those within the national fishing zones.

In 1998, the Contracting Parties agreed upon a Joint Control and Enforcement Scheme to be applied in the Regulatory Area[1]. This Scheme entered into force on 1 July 1999.

VMS is one of the key elements of the Scheme. Under the Scheme, Contracting Parties shall track their vessels by VMS. Entry / exit reports and position reports are forwarded to the NEAFC Secretariat in computer-readable format (the so-called North Atlantic format). These reports are retransmitted in real time in the same computer-readable format to Contracting Parties with an active inspection presence in the Regulatory Area, in compliance with specific provisions on secure and confidential treatment.

(iii). Fisheries agreement between Norway and the EU

Norway and the EU have a reciprocal fisheries agreement by virtue of which their vessels can operate in each others waters under certain conditions. In July 1999, Norway and the EU started a pilot project for VMS that lasted until December 1999. A score of vessels, mainly Norwegian fishing in the waters of the EU, have participated in the project.

Subsequently, an agreement was concluded with a view to implement an operational VMS scheme. The basic provisions of the agreement are that vessels from both Parties are tracked by their flag state FMC and that the position reports are retransmitted to the FMC of the coastal state when a vessel operates in the waters of the other Party. Furthermore, specific entry and exit messages are sent when a vessel enters and leaves the waters of the other Party. All messages are transmitted in the North Atlantic Format. The scheme became fully operational on 1 July 2000.

The EU concluded a similar agreement with the Faeroe Islands, and Norway did so with Iceland and Russia.

Member States endeavour to transmit VMS data concerning their vessels to the coastal state in a correct and timely way, since the EU wants to be a trustworthy international partner.

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[1] The scheme of control and enforcement in respect of fishing vessels fishing in areas beyond the limits of national fisheries jurisdiction in the convention area ("The Scheme").

6. FURTHER DEVELOPMENTS

In view of the importance of VMS as a means of control, the European Union will review ways of improving the application of the system. In particular, and if appropriate, the European Commission may bring forward proposals for the extension of the scope of VMS to vessels measuring less than 20 metres between perpendiculars or 24 metres overall in length as a means of control of fishing effort.

On the international scene, one can expect that efforts will be made to define global VMS strategies, in particular with relation to standardisation of VMS reports.

From a technical point, satellite systems continue to evolve[1] and there may be further developments in the near future regarding the expansion of other applications such as an interface with an electronic logbook or the linking of VMS with vessel sensors placed in trawl winches which will allow the enforcement authorities to monitor the vessel more thoroughly. The European Commission is also exploring the potential of remote sensing techniques for fisheries monitoring. A study concerning the NAFO area has clearly shown that space borne synthetic aperture radar (SAR) images could complement VMS[2]. A further study is conducted to investigate means to make these images available for operational MCS in nearly real time at an affordable price. It is worth while pointing out here that the European Union is already using remote sensing for the control of area-based subsidies to farmers.

Further trials will be conducted as necessary in order to gain experience with other advanced technologies with a view of promoting their introduction by Member States.

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1 The future of satellite systems in European fisheries protection and management, Study in support of the Common Fisheries Policy, Final Report, August 1998 - Navigs s.a.r.l..

2 SAR - imagery for fishing vessel detection, Draft Final Report, July 2000 - Joint Research Centre of the European Commission.